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(54) Heat resistant cabinet and method for its manufacture

(57) The heat resistant cabinet has an enclosure (11), for receiving temperature-sensitive articles, defined by a container (17) having walls filled with a mixture of heat absorbing material of high heat of fusion and a material binding the heat absorbing material when it becomes liquid. One such mixture is 90 percent by volume sodium - 9 - metasilicate and 10 percent by volume of plaster of Paris. On absorption of heat the mixture forms a relatively solid mass remaining in place and still having a heat barrier effect. The mixture is preferably introduced in the particulate state and is efficiently padded between the walls by vibration during filling.

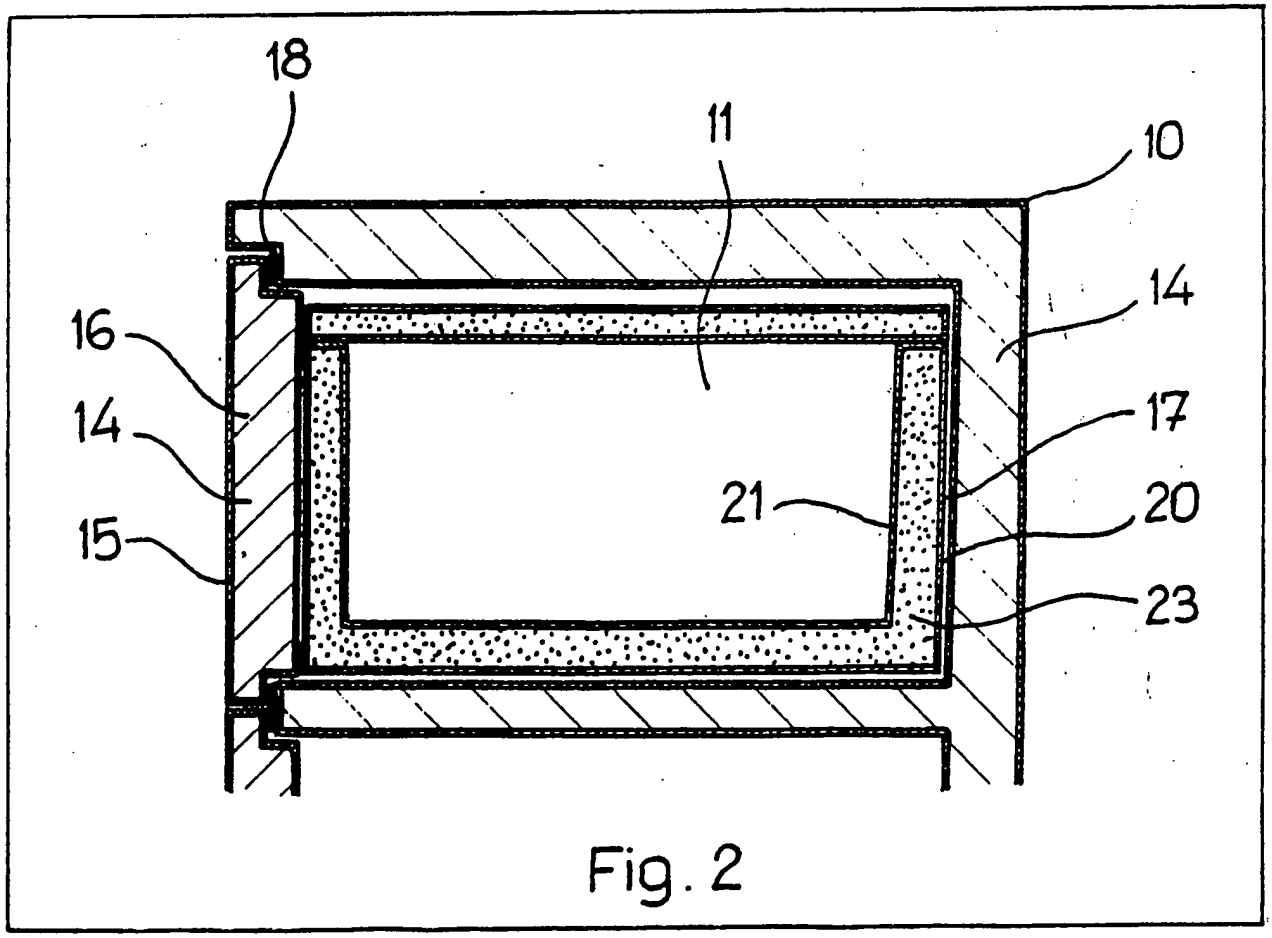

Fig. 2

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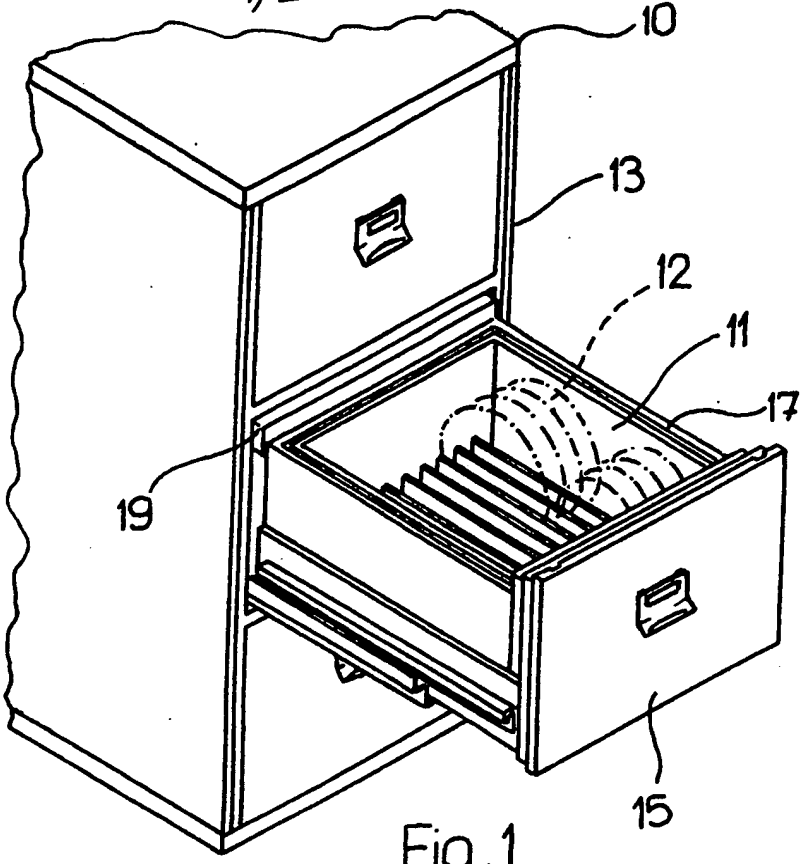


Fig. 1

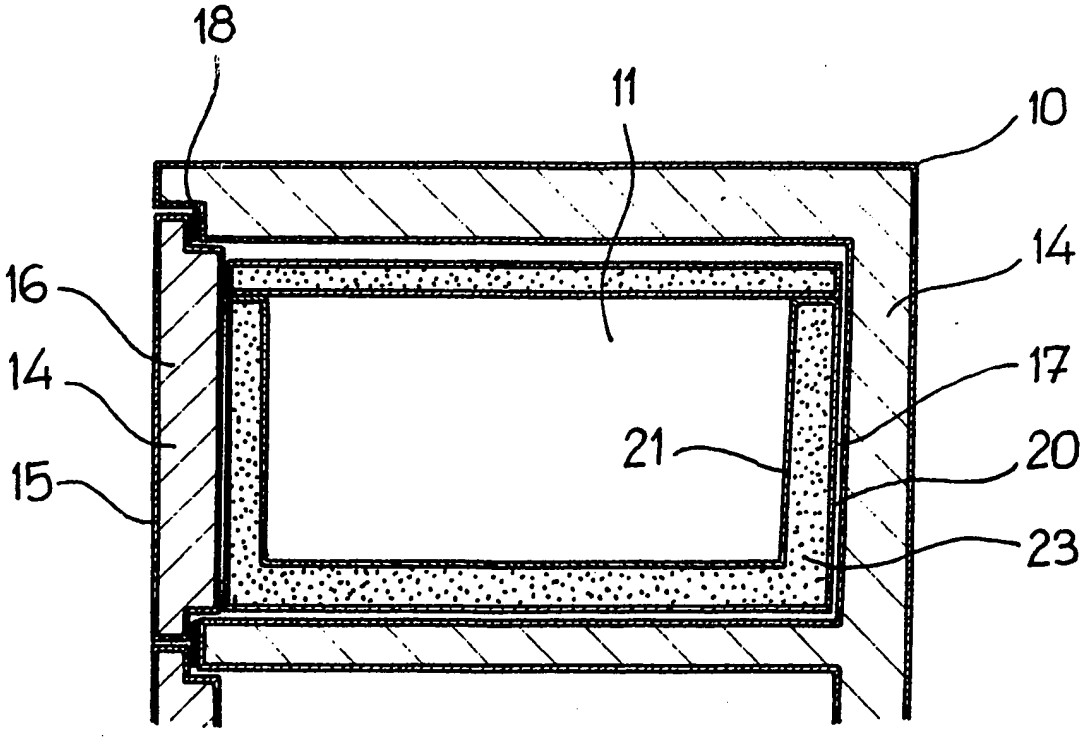


Fig. 2

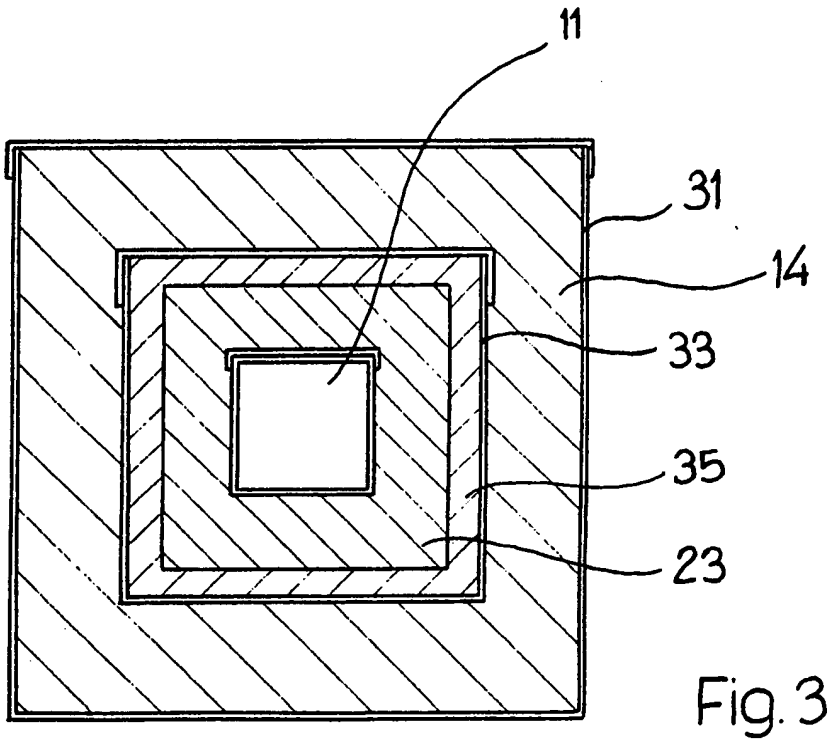
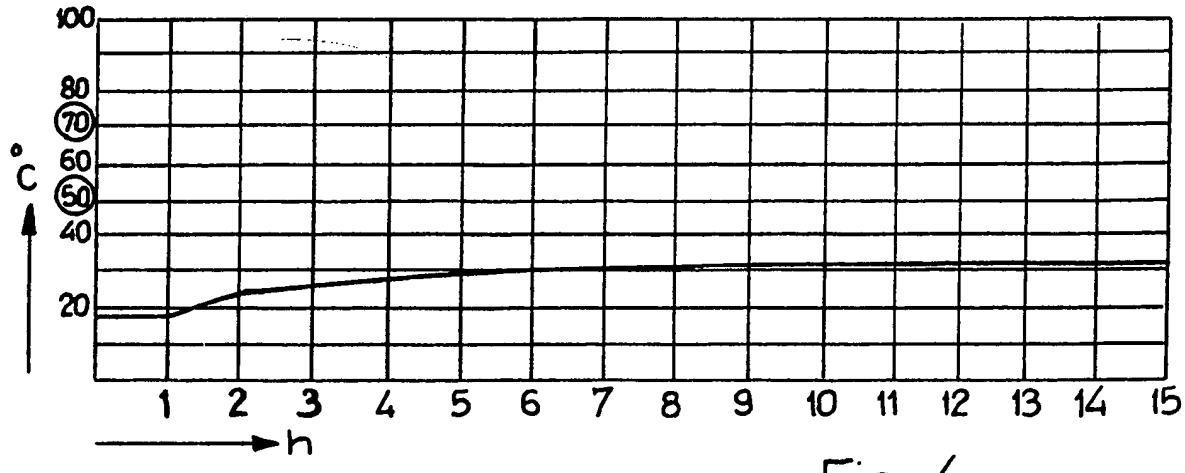

11
31
14
33
35
23

Fig. 3


100
80
70
60
50
40
20
°C
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4
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6
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8
9
10
11
12
13
14
15
h

Fig. 4

SPECIFICATION

Heat resistant cabinet and method for its manufacture

The invention refers to a heat resistant cabinet with at least one compartment for storing temperature-sensitive articles, such as magnetic tapes, floppy discs and the like, the compartment being surrounded by a mixture of a heat absorbing material having a large heat fusion and a further material.

There exists cabinets with an external fire resistant housing comprising one or more layers of fire resistant material such as gypsum, concrete and the like. These layers form a heat barrier. The degree of protection depends on the thickness, the kind and the amount of the materials used. In addition to these physical facts concerning the walls of the cabinet often other factors are also of importance. If for example magnetic tapes, floppy discs or microfilms must be stored, their sensitivity to moisture or their inflammability must be taken into consideration.

In the US-patent 3 559 594 a cabinet with heat insulated walls is described in which a further cabinet is provided which has walls with a filling of a heat absorbing material, e.g. sodium acetate trihydrate which melts at approximately 58°C and is capable to absorbe large amounts of heat. Of advantage is also sodium metasillicate (German published application 24 13 644). To keep as much as possible heat from entering the interior of the cabinet, it is necessary to avoid empty spaces in the filling. In the cited US-patent 3 559 594 it is taught to fill the spaces completely by casting liquid sodium acetate trihydrate. The casting has the disadvantage that it does not avoid hollow spaces in the form of enclosed air bubbles. Further, the casting is a manufacturing method requiring much skill and relatively long cooling times. There is also always the danger of spilling of hot filling material. In cooling there is shrinkage of the material which may also lead to undesirable hollow spaces.

The German patent 22 45 453 teaches to provide in the interior of a cabinet with heat resistant walls a container having walls formed by cells filled with sodium acetate trihydrate in particulate form. The manufacturing of this cell must not take place by casting hot material, but can take place by filling-in a certain amount of particulate material at room temperature. Because on the transport of the cabinet the particulate materjal can settle somewhat, a relatively large hollow space is obtained at the top. In the case of a fire melting of the particulate material may increase this hollow space. In order to avoid that there heat may enter into the container heat conducting elements are provided in the hollow space. These heat conducting elements extend into the heat absorbing material to transfer the heat into this material. This prior art heat resistant cabinet has not only the disadvantage that it is relatively complicated and expensive, but in the case of a fire there exists also the danger of leaking of liquid sodium acetate trihydrate. The leaking liquid may eventually damage the stored articles. If it is desired to prevent a leakage of liquid material the cell must be manufactured watertight. However, this is an additonal expense.

The German patent 22 45 553 further reports on tests with different mixtures comprising different amounts of further materials, for example particulate vermiculite, particulate perlite or fine saw-dust. These further materials have the purpose to alter the heat regulating effects of the sodium acetate trihydrate.

It is an object of the present invention to provide a heat resistant cabinet of the kind mentioned before providing a better heat protection of the stored goods and to prevent leaking of molten heat absorbing material in a simple manner.

According to the invention this is obtained in that, said further material of said mixture has the property, when the heat absorbing material becomes liquid by absorbing heat, to bind the heat absorbing material and to form together with it a doughy or solid mass.

This has the advantage that the layer consisting of a mixture of heat absorbing material and a further material need not be contained in a fluidtight container to prevent a leakage of liquid in case of a fire. It is sufficient to use a container manufactured e.g. by spot welding and which is not fluidtight. In this way the cabinet can be made at lower cost. Compared with prior art cabinets a substantially higher heat protection is obtained which may be explained by the fact that in case of a fire the mixture does not become liquid and therefore does not collapse, but remains practically solid in its original location. It has also been found that the transformation of the mixture takes place slowly from the exterior toward the interior, whereby the transformed part of the mixture having no capacity anymore to absorb heat in the region of the melting point still has the effect of a heat barrier. In contrast to this on prior art cabinets where the heat absorbing material becomes liquid, convection currents take place in the liquid transporting heat from the hot exterior wall to the cold interior wall.

Said further material of the heat resistant cabinet has preferably the property to bind the heat absorbing material chemically when it becomes liquid in absorbing heat. Said further material is preferably an inorganic material, e.g. a water absorbing inorganic material. Such materials are not combustible and generally cheap. Of particular advantage are burned plaster of Paris, e.g. gypsum as normally used in construction and for manufacturing heat resistant cabinets. The latter fact makes the use of plaster of Paris particularly advantageous, because in this case no further materials must be kept in store for manufacturing the cabinet. However, also the use of caustic lime or cement or similar material is possibl , but generally not as advantageous, because of the problem of additional inventory.

Sodium-metasilicate or sodium acetate trihydrate may be used as heat absorbing material. Sodium acetate trihydrat has a somewhat higher melting point (58°C) than sodium - 6 - metasilicate or sodium - 9 - metasilicate. The mixtur is preferably in particulate form, but may also be in form of powder. A

mixture in particulate form is generally easier to handle in manufacturing than a mixtur in form of powder. How ver, a mixtur in form of powder generally p rmits a higher packing density. Of particular advantag is a mixture in which the heat absorbing material is in particulate form and the further material is in form of powder. If plaster of Paris is used in form of powder the inventory problem is simplified, because plaster of Paris is anyway used for manufacturing of heat resistant cabinet, and it is delivered as powdery material. A mixture of particulate and powdery material provides also a high packing density, because the spaces between the particles are filled by powder. The mixture consists of about 90 percent by volume of heat absorbing material and about 10 percent by volume of said further material, normally plaster of Paris. The surprisingly high binding effect of plaster of Paris has the advantage that the mixture has a very high content of heat absorbing material. In spite of this the mixture has in case of a fire in addition to the effect of absorbing heat the effect of a heat barrier, because it does not become liquid and remains in place. The heat barrier effect contributes to the heat protecting effect of the layer consisting of th new mixture.

The invention also concerns a method for manufacturing a cabinet. This method is characterized in that the filling in of the mixture takes place under vibration. During the filling operation the cabinet or cabinet part can be vibrated to obtain a dense packing. Embodiments of the invention will now be described with reference to the drawing.

Fig. 1 shows a cabinet known per se having a housing with insulating gypsum walls and a container located in a drawer. The walls of the container contain a heat absorbing material.

Fig. 2 shows a cross section through a cabinet in figure 1.

Fig. 3 shows the design of a test sample.

Fig. 4 shows the test results from a fire test at a t mperature of 900°C in the firing room.

In figure 1 a cabinet 10 known per se is shown. The housing 13 has an insulation of a heat barrier material, e.g. gypsum. The drawer 15 is used for storing h at s nsitive articles, e.g. magnetic tapes 12. The compartment room 11 is formed by a container 17 having walls of a heat absorbing material having a large heat of fusion, e.g. sodium acetate trihydrate. Also the cover 19 of the container 17, which is lifted by a mechanism on pulling out the drawer 15 contains a heat absorbing material having a large heat of fusion. Further details on such a cabinet are found in the German patent 22 45 453.

Cabinets of the kind shown in figure 1 are known in different forms. Generally the space containing the articles to be stored is always surrounded by a layer comprising a heat absorbing material having a high heat of a fusion or at least a mixture of a heat absorbing material having a high heat of fusion and a further material. Generally still a further layer of a heat barri r mat rial is provided.

In figure 2 a cr ss section through an mbodiment of a heat resistant cabin t according to th invention is schematically shown. The cabinet housing 10 of sheet metal contains a gypsum insulation 14. Th same is true for the front sid 16 of the drawer 15. In known mann r a s al 18 f r sealing the drawer is provided. In the interior of the draw r 15 is a space 11 for storing temperature-sensitive articles. This space is form d by a container 17 comprising an outer wall 20 and an inner wall 21 of sheet metal or another suitable material. The space between the wall 20, 21 is provided with a mixture 23 of a heat asborbing material having a high heat of fusion and a further material having the property to bind the heat absorbing material when it becomes liquid in absorbing heat and to form with the heat absorbing material a doughy or solid mass.

The mixture 23 consists for example of 90 percent by volume of sodium metasilicate - 9 - hydrate and 10 percent by volume of plaster of Paris. The sodium metasilicate - 9 - hydrate is normally furnished in particulate form whereas the plaster of Paris is normally in form of powder. However, it is possible to use instead of gypsum another inorganic material which binds the sodium metasilicate - 9 - hydrate e.g. chemically when it becomes liquid in absorbing heat. For example instead of plaster of Paris also caustic lime or cement may be used as they are also known as water absorbing binding materials in the construction of housings. Most sodium metasilicates have a favourable melting point being around 50°C. Of particular use is sodium - 6 - metasilicate and sodium - 9 - metasilicate, but also sodium acetate trihydrate is an advantageous heat absorbing material. In manufacturing of the cabinet it is of advantage when the filling of the mixture takes place under vibration. In this way a dense packing is obtained.

An example of a test with a test body will now be described. A test body shown schematically in figure 3 has been tested in a fire room at a temperature of 900°C. During 85 minutes the body has been directly covered by the flame, whereupon the body has been taken from the furnace. The body schematically shown in figure 3 comprises an exterior steel cover 31 and an interior steel cover 33, between which there is a layer 14 of porous gypsum having a thickness of 70 mm. Then follows a mineral fiber barrier plate 35 which is available under the designation Isover-plate SP/TR 180. This barrer plate 35 has a thickness of 20 mm. The layer 23 comprising a mixture of 90 percent by volume of sodium metasilicate - 9 - hydrate and 10 percent by volume of plaster of Paris has been 40 mm thick. As the curve of figure 4 shows also after 15 hours no increase of the interior temperature above 32°C has been detected.

CLAIMS

1. A heat resistant cabinet with at least one compartment for storing temperature-sensitive articles, the compartment being surrounded by a mixture of a heat absorbing material having a large heat of fusion, and a further material, wherein the further material of the said mixture has the property, when the heat abs rbing material becom s liquid by absorbing heat to bind the heat absorbing material and to form t gether with it a doughy or solid mass.

2. A cabinet as claimed in claim 1, wh r in the said further mat rial chemically binds the heat absorbing material becoming liquid in absorbing heat.

3. A cabinet as claimed in claim 1 or 2, wherein th said further material is an inorganic material.

4. A cabinet as claimed in claim 3, wherein the said further material is a water absorbing inorganic material.

5. A cabinet as claimed in any one of claims 1 to 4, wherein the said further material is plaster of Paris.

6. A cabinet as claimed in any one of claims 1 to 4, wherein the said further material is caustic lime.

7. A cabinet as claimed in any one of claims 1 to 4, wherein the said further material is cement.

8. A cabinet as claimed in one of the claims 1 to 7, wherein the heat absorbing material is sodium metasilicate.

9. A cabinet as claimed in one of the claims 1 to 7, wherein the heat absorbing material is sodium - 6 -metasilicate.

10. A cabinet as claimed in one of the claims 1 to 7, wherein the heat absorbing material is sodium - 9 - metasilicate.

11. A cabinet as claimed in one of the claims 1 to 7, wherein the heat absorbing material is sodium acetate trihydrate.

12. A cabinet as claimed in one of the claims 1 to 11, wherein the mixture is in particulate form.

13. A cabinet as claimed in one of the claims 1 to 11, wherein the mixture is in form of powder.

14. A cabinet as claimed in one of the claims 1 to 11, wherein the heat absorbing material is in particulate form and said other material in form of powder.

15. A cabinet as claimed in one of the claims 1 to 14, characterised in that the mixture consist of about 90 percent by volume of heat absorbing material and about 10 percent by volume of said further material.

16. A cabinet as claimed in any preceding claim, wherein the compartment is further surrounded by a heat barrier layer.

17. A cabinet substantially as herein described with reference to and as illustrated by the accompanying drawings.

18. A method of manufacturing a cabinet according to one of the claims 1 to 17, wherein the filling-in of the mixture takes place under vibration.

19. A method of manufacturing a heat resistant cabinet substantially as herein described with reference to and as illustrated by the accompanying drawings.

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